

CLAIMS

What Is Claimed Is:

1. A transfer case comprising:

an input shaft;

first and second output shafts;

an interaxle differential having an input member, a first output member coupled to said first output shaft, a second output member coupled to said second output shaft, and a gearset interconnecting said input member to said first and second output members;

a range unit having an output component driven at a reduced speed relative to said input shaft;

a range clutch operable in a high-range mode to couple said input member of said interaxle differential for rotation with said input shaft and in a low-range mode to couple said input member of said interaxle differential for rotation with said output component of said range unit;

a mode clutch operable in a released mode to permit unrestricted speed differentiation between said first and second output members of said interaxle differential and in a locked mode to prevent speed differentiation therebetween; and

a power-operated actuation mechanism including a motor, a drive shaft driven by said motor, a range actuator for shifting said range clutch between its high-range and low-range mode in response to rotation of said drive shaft through a first amount of rotary travel, and a mode actuator for shifting said mode clutch between its released and locked modes in response to rotation of said drive shaft through a second amount of rotary

travel, said mode actuator including a ball-ramp unit and a gear assembly interconnecting said ball-ramp unit to said drive shaft.

2. The transfer case of Claim 1 wherein said ball-ramp unit includes a first plate, a second plate having a gear segment, and rollers engaging a cam surface formed on at least one of said first and second plates, said gear assembly interconnecting said gear segment of said second plate for rotation with said drive shaft.

3. The transfer case of Claim 2 wherein said cam surface causes said first plate to move axially in response to rotary movement of said second plate, and wherein rotation of said second plate in response to rotation of said drive shaft through said second amount of travel causes said first plate to move between a first position whereat said mode clutch is in its released mode and a second position whereat said mode clutch is in its locked mode.

4. The transfer case of Claim 1 wherein said range clutch includes a dog clutch moveable between a first position and a second position, said dog clutch operable in its first position to establish said high-range mode and in its second position to establish its low-range mode, and wherein said range actuator includes a range fork engaging said dog clutch and a mechanism for causing movement of said range fork in response to rotation of said drive shaft through said first amount of travel for moving said dog clutch between its first and second positions.

5. The transfer case of Claim 4 wherein said mechanism is a cam driven by said drive shaft, said range fork having a first segment retained in a groove formed in said cam and a second segment engaging said dog clutch.

6. A transfer case comprising:

an input shaft;

first and second output shafts;

a range unit driven by said input shaft and having an output component driven at a reduced speed relative to said input shaft;

a range clutch operable in a high-range mode to couple said first output shaft for rotation with said input shaft and in a low-range mode to couple said first output shaft for rotation with said output component of said range unit;

a mode clutch operable in a released mode to permit relative rotation between said first and second output shafts and in a locked mode to prevent relative rotation therebetween; and

a power-operated actuation mechanism including a motor, a drive shaft driven by said motor, a range actuator for shifting said range clutch between its high-range and low-range mode in response to rotation of said drive shaft through a first amount of rotary travel, and a mode actuator for shifting said mode clutch between its released and locked modes in response to rotation of said drive shaft through a second amount of rotary travel, said mode actuator including a ball-ramp unit and a gear assembly interconnecting said ball-ramp unit to said drive shaft.

7. The transfer case of Claim 6 wherein said ball-ramp unit includes a first plate, a second plate having a gear segment, and rollers engaging a cam surface formed on at least one of said first and second plates, said gear assembly interconnecting said gear segment of said second plate for rotation with said drive shaft.

8. The transfer case of Claim 7 wherein said cam surface causes said first plate to move axially in response to rotary movement of said second plate, and wherein rotation of said second plate in response to rotation of said drive shaft through said second amount of travel causes said first plate to move between a first position whereat said mode clutch is in its released mode and a second position whereat said mode clutch is in its locked mode.

9. The transfer case of Claim 6 wherein said range clutch includes a dog clutch moveable between a first position and a second position, said dog clutch operable in its first position to establish said high-range mode and in its second position to establish its low-range mode, and wherein said range actuator includes a range fork engaging said dog clutch and a mechanism for causing movement of said range fork in response to rotation of said drive shaft through its first amount of rotary travel for moving said dog clutch between its first and second positions.

10. The transfer case of Claim 9 wherein said mechanism is a cam driven by said drive shaft, said range fork having a first segment retained in a groove formed in said cam and a second segment engaging said dog clutch.

11. A transfer case comprising:

an input shaft;

first and second output shafts;

an interaxle differential having an input member, a first output member coupled for rotation with said first output shaft, a second output member coupled for rotation with said second output shaft, and a gearset interconnecting said input member to said first and second output members;

a range unit driven by said input shaft and having an output component driven at a reduced speed relative to said input shaft;

a range clutch operable in a high-range mode to couple said input member of said differential for rotation with said input shaft and in a low-range mode to couple said input member of said differential for rotation with said output component of said range unit;

a mode clutch operable in a released mode to permit relative rotation between said first and second output shafts and in a locked mode to prevent relative rotation therebetween;

a range actuator moveable between a first position and a second position for causing corresponding shifting of said range clutch between its high-range and low-range modes;

a mode actuator having a first plate, a second plate, and rollers engaging cam surfaces formed in said first and second plates, said first plate adapted to move between a first position whereat said mode clutch is in its released mode and a second position whereat said mode clutch is in its locked mode in response to rotation of said second

plate;

a power-operated actuation mechanism including a drive shaft, a first rotary device interconnecting said range actuator for rotation with said drive shaft, a second rotary device interconnecting said second plate for rotation with said drive shaft, and a motor for driving said drive shaft; and

a control system for controlling actuation of said motor.

12. The transfer case of Claim 11 wherein said first rotary device is a cam having a groove, and wherein said range actuator engages said groove such that rotation of said cam causes corresponding movement of said range actuator between its first and second positions.

13. The transfer case of Claim 11 wherein said second rotary device is a gear assembly interconnecting said second plate for rotation with said drive shaft.

14. The transfer case of Claim 13 wherein said gear assembly includes a first gear fixed for rotation with said drive shaft, a second gear fixed to said second plate, and a third gear meshed with said first and second gears.

15. A transfer case comprising:

an input shaft;

first and second output shafts;

a range unit driven by said input shaft and having an output component driven at a reduced speed relative to said input shaft;

a range clutch operable in a high-range mode to couple said first output shaft for rotation with said input shaft and in a low-range mode to couple said first output shaft for rotation with said output component of said range unit;

a mode clutch operable in a released mode to permit relative rotation between said first and second output shafts and in a locked mode to prevent relative rotation therebetween;

a range actuator moveable between a first position and a second position for causing corresponding shifting of said range clutch between its high-range and low-range modes;

a mode actuator having a first plate, a second plate, and rollers engaging cam surfaces formed in said first and second plates, said first plate adapted to move between a first position whereat said mode clutch is in its released mode and a second position whereat said mode clutch is in its locked mode in response to rotation of said second plate;

a power-operated actuation mechanism including a drive shaft, a first rotary device interconnecting said range actuator for rotation with said drive shaft, a second rotary device interconnecting said second plate for rotation with said drive shaft, and a motor for

driving said drive shaft; and

a control system for controlling actuation of said motor.

16. The transfer case of Claim 15 wherein said first rotary device is a cam having a groove, and wherein said range actuator engages said groove such that rotation of said cam causes corresponding movement of said range actuation between its first and second positions.

17. The transfer case of Claim 16 wherein said second rotary device is a gear assembly interconnecting said second plate for rotation with said drive shaft.

18. The transfer case of Claim 17 wherein said gear assembly includes a first gear fixed for rotation with said drive shaft, a second gear fixed to said second plate, and a third gear meshed with said first and second gears.